FY 2004 Test and Evaluation Guidance
for
Common High Performance Computing Software Support Initiative (CHSSI)
Portfolios and Projects

August 1, 2003

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Background and Purpose

Information technology investments and software development efforts, in particular, are costly and risky. The Department of Defense (DoD) and all other federal departments, led by the General Accounting Office (GAO), have been increasingly improving software development efficiency and success rates through focused management emphasis and effective test and evaluation.

The High Performance Computing Modernization Program (HPCMP) budget and expenditures are scrutinized because it receives funds to provide essential high performance computing hardware, networking, software, and programming environments and training for the DOD science and technology (S&T) and test and evaluation (T&E) communities engaged in important DOD work. The federal government's emphasis on improved software development applies to the HPCMP Common High Performance Computing Software Support Initiative (CHSSI), which invests approximately $20M annually, because it makes good sense, because we are governed by the federal laws and executive orders dealing with information technology investments, and because we and the projects we support are subject to independent evaluation by the Joint Interoperability Test Command (JITC). The independent evaluation is submitted to DoD's Director, Operational Test and Evaluation who reports performance to the Congress and the report greatly determines our funding levels and, for that matter, the program's continuation or cancellation. This evaluation places requirements upon CHSSI's performance as well as the other facets of the HPCMP. CHSSI must meet specified criteria in order to be considered successful and eligible for continued funding. These criteria are expressed in several categories and are discussed in subsequent sections of this document.

We developed this document to provide Computational Technology Area (CTA) Leaders, Portfolio Leaders, and Project Principal Investigators and their development teams with a coherent and comprehensive reference for planning, conducting, and reviewing test and evaluation of projects within their purview. **It is important for all concerned** to become familiar with the contents of this document and to cultivate an organized and proficient software development ethic that will result, finally, in a product of great benefit to the user community.

Purpose of CHSSI

The HPCMP was established because Congress saw that the DoD was falling far behind industry and academia in the capability of high performance computers (HPC) available to facilitate scientists' work on technological challenges facing DoD. Congress directed the Director, Defense Research and Engineering to establish a program to modernize the HPC capability at the DoD laboratories and to keep the systems current with technological developments.

At the same time, there was a problem — our scientific community had old vector codes and would not have been able to readily use the new systems. CHSSI was initiated to help the scientists port their codes to the newer systems and keep them abreast of current HPC expertise. Its mission is to expand Service/Agency efforts to provide robust production-level software for modeling, simulation and computation in application areas of highest impact to DoD, which efficiently utilize HPC capabilities, and perform on a range of HPC platforms, with focus on accuracy, efficiency, reusability, and scalability. CHSSI is expected to encourage, support, facilitate and empower DoD scientists and engineers to develop, update, and exploit software tools that make full use of available HPC technology, and to foster dynamic and fruitful inter-service and cross discipline collaborations necessary to accomplish DoD high priority test and technology goals.

The purpose of CHSSI test and evaluation is to facilitate the creation of usable software for parallel environments and to comply with federal laws and DoD directives and guidance pertaining to information technology investments.

For a detailed explanation of the various standards and measures associated with CHSSI, please see Appendix A.

CHSSI Test and Evaluation (T&E)

Overview

To manage all of these requirements, we have instituted the CHSSI T&E process. Test and evaluation for CHSSI is comprised of appraising performance against Project Management Indicators (PMI), which are evaluated throughout the life of each project, a series of test events and reviews, which occur at specified intervals, and, for selected projects, a final operational test readiness review (OTRR) to determine whether the software is ready for operational testing. PMIs, the test events, and the OTRR help us to foster good software development practices and, thus to reduce risk and focus the development team on working toward the expected outcome of the effort – a valid, efficient, scalable, interoperable, reliable, user-friendly code which is very much needed by the user community. They are also used by JITC to report CHSSI's performance to the Director, Operational Test and Evaluation.

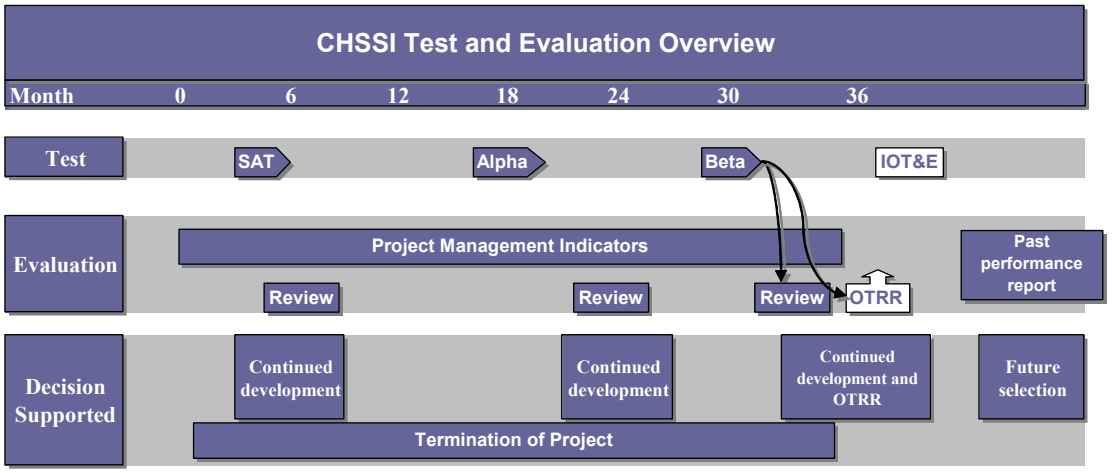

Figure 1: CHSSI T&E Process Overview

Relative Importance of Project Management Indicators

The test events described below are key performance/decision points that determine whether the development effort will continue. However, the test events are not the only decision points in the CHSSI test and evaluation process. We pay attention to the PMIs throughout the development effort. The PMIs serve as evaluation tools that appraise the quality of the project team's management and development practices. They are "thermometer readings" that give a good indication of the health of the development effort. The indicators are key behaviors for successful software development processes. **Please spend some time and effort reviewing the PMIs, which are explained in detail at Appendix A.**

Test Events

The three distinct **developmental** test events for CHSSI projects are the software acceptance test (SAT), the alpha test, and the beta test. Each has a particular purpose in the life cycle of the development effort. Selected projects also undergo an operational test readiness review (OTRR) to certify readiness of the software for initial **operational** test and evaluation. Below is an illustration of the test series.

Test Phase	Purpose	Users	Test Reviewers	Decision to Continue Project
Software Acceptance Test	Analyze and document starting point.	Development team	CTA/Portfolio Leader	CTA/Portfolio Leader
Alpha	Assess progress and set course correction.	Development team and "friendly" parties	Internal to CTA/Portfolio Leader's organization	HPCMP
Beta	Assess progress and OTRR/OT&E feasibility.	Subset of targeted community (honest brokers)	External review	HPCMP
Operational Test Readiness Review	Certify readiness for operational testing.	Targeted user community	External reviewers	HPCMP and JITC
Initial Operational Test and Evaluation	Assess operational suitability.	Targeted user community	External reviewers	Sponsoring Service or Agency

Figure 2: CHSSI Test Events

The sections which follow provide detailed information about the developmental test events and about the operational test readiness review. It is very important that the CTA/Portfolio Leader, the Project Principal Investigator, and the development team members who will assist in the test and evaluation process understand the requirements for CHSSI T&E in general and each successive test phase, particularly as the development effort develops it's Critical Technical Parameters, software documentation, and test cases or scenarios, and as the team prepares for the test phase. Below is a matrix of documents that should be read and understood by all concerned.

Document/Item	Intro	SAT	Alpha	Beta	OTRR	APP A	APP B	APP C	APP D
Introduction	PDF								
Test Guidance		PDF	PDF	PDF	PDF				
Test Plan Guidance		PDF	PDF	PDF	PDF				
Test Plan Template		DOC	DOC	DOC	DOC				
Test Report Guidance		PDF	PDF	PDF	PDF				
Test Report Template		DOC	DOC	DOC	DOC				
Evaluation Guidance			PDF						
Evaluation Report Guidance			PDF	PDF	PDF				
Evaluation Report Template			DOC	DOC	DOC				
Review Guidance			PDF	PDF	PDF				
CHSSI Metrics						PDF			
Abbreviations and Acronyms							PDF		
Prototypical Test Results Matrix								XLS	
Prototypical Review Briefing Template									PPT

Figure 3: Document Matrix